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(54) WIRELESS COMMUNICATION METHOD, NETWORK DEVICE AND TERMINAL DEVICE

(57) Embodiments of the present application provide a wireless communication method, a network device and a terminal device, which may reduce the requirement on capability of the terminal device for receiving signals, reduce the processing burden of the terminal device, and reduce the battery consumption of the terminal device. The method comprises: transmitting a first control channel in a first period of time, wherein the first control channel carries scheduling information of a first data channel; receiving or transmitting the first data channel in a second period of time according to the scheduling information of the first data channel; transmitting a second control channel in a frequency division multiplexing manner with the first data channel at part time of the second period of time, wherein a data channel scheduled by the second control channel does not include the first data channel, and a starting position of the part time is not earlier than an ending position of the first period of time.

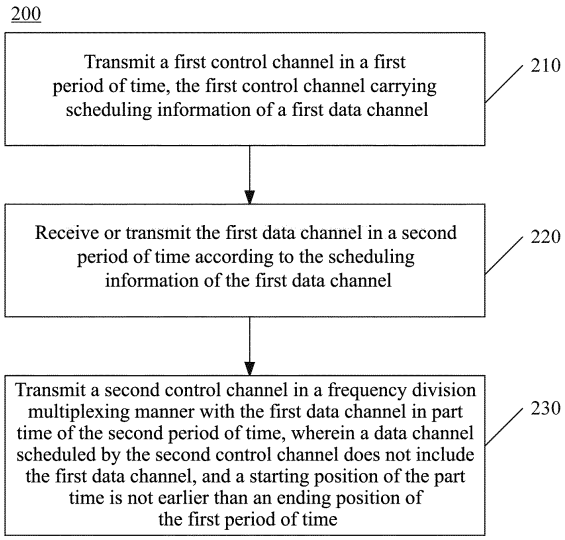

FIG. 2

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Description

Technical Field

[0001] The present application relates to the field of communication, and more particularly to a wireless communication method, a network device and a terminal device.

Background

[0002] In a current Long Term Evolution (LTE) system, a Physical Downlink Control Channel (PDCCH) occupies first few symbols of each subframe. During transmission of full frequency band of a carrier, a Physical Downlink Shared Channel (PDSCH) cannot be transmitted in symbols where the PDCCH is located, and the PDSCH starts to be transmitted only after the PDCCH is finished.

[0003] In a 5G (also known as New Radio (NR)) system, it is supported that a PDCCH and a PDSCH occupy different frequency domain resources in first few symbols of a time slot. However, the PDSCH of the first few symbols cannot start to be demodulated until decoding for the PDCCH is completed, which results in that a terminal needs to pre-cache signals of few symbols. In addition, 5G bandwidth is very large, which brings great challenges to the buffering capability, processing burden, and battery power consumption of the terminal.

Summary

[0004] Embodiments of the present application provide a wireless communication method, a network device, and a terminal device, which may reduce requirement on capability of the terminal device for receiving signals, reduce processing burden of the terminal device, and reduce battery consumption of the terminal device.

[0005] In a first aspect, there is provided a wireless communication method including: transmitting a first control channel in a first period of time, wherein the first control channel carries scheduling information of a first data channel; receiving or transmitting the first data channel in a second period of time according to the scheduling information of the first data channel; and transmitting a second control channel in a frequency division multiplexing manner with the first data channel in part time of the second period of time, wherein a data channel scheduled by the second control channel does not include the first data channel, and a starting position of the part time is not earlier than an ending position of the first period of time.

[0006] Therefore, in an embodiment of the present application, a network device transmits a first control channel during a first period of time, and may schedule a first data channel transmitted during a second period of time, wherein a second control channel is transmitted in a frequency division multiplexing manner with the first data channel in part time of the second period of time, and a data channel scheduled by the second control channel does not include the first data channel, wherein a starting position of the part time is not earlier than an ending position of the first period of time. That is to say, the data channel that is frequency division multiplexed with the second control channel may be completely or partially scheduled by a control channel before the second control channel, thereby preventing a terminal device from caching too many data symbols, thereby reducing the requirement on the capability of the terminal device for receiving signals, reducing the processing burden of the terminal device, and reducing the battery consumption of the terminal device.

[0007] Optionally, a starting position of the first period of time is earlier than a starting position of the second period of time, the first control channel between the starting position of the first period of time and the starting position of the second period of time, and a second data channel are frequency division multiplexed, and the second data channel is scheduled by a control channel before the first control channel.

[0008] Optionally, an ending position of the first period of time is earlier than or equal to a starting position of the second period of time.

[0009] Optionally, a starting position of the second control channel in the second period of time is later than the starting position of the second period of time, and/or, an ending position of the second control channel in the second period of time is earlier than an ending position of the second period of time.

[0010] Optionally, the second control channel is only transmitted in part time of the second period of time.

[0011] Optionally, a time difference between a starting position of the first period of time and a starting position of the second period of time is greater than or equal to the maximum value of multiple time differences, which may exist in a wireless communication process, between multiple control channels and their scheduled data channels.

[0012] Optionally, the method further includes: transmitting indication information including information of a position of the second period of time relative to the first period of time and/or information of a length of the second period of time.

[0013] Optionally, the indication information is used for indicating a relative position of a starting position of the second period of time relative to a starting position of the first period of time, or for indicating a relative position of the starting position of the second period of time relative to the ending position of the first period of time.

[0014] Optionally, transmitting the indication information includes: transmitting the indication information, wherein the indication information includes information of positions and/or lengths of transmission time corresponding to multiple data channels scheduled by multiple control channels, and the multiple control channels include the first control channel.

[0015] Optionally, transmitting the indication informa-

tion includes: transmitting the indication information through a high-layer signaling or physical-layer control signaling.

[0016] In a second aspect, there is provided a wireless communication method including: transmitting indication information including information of a position and/or a length of a transmission time period of a data channel scheduled by a control channel; transmitting the control channel; and receiving or transmitting the data channel during the transmission time period of the data channel.

[0017] Optionally, the indication information is used for indicating a relative position of a starting position of the transmission time period of the data channel relative to a starting position of a transmission time period of the control channel; or, a relative position of a starting position of the transmission time period of the data channel relative to an ending position of a transmission time period of the control channel.

[0018] Optionally, transmitting the indication information includes: transmitting the indication information, wherein the indication information includes information of positions and/or lengths of transmission time corresponding to multiple data channels scheduled by multiple control channels, and the multiple control channels include the control channel.

[0019] Optionally, transmitting the indication information includes: transmitting the indication information through a high-layer signaling or physical-layer signaling.

[0020] In a third aspect, there is provided a wireless communication method including: on a first control channel transmitted in a first period of time, receiving, by a terminal device, scheduling information corresponding to the terminal device in scheduling information of a first data channel, wherein the first control channel is used for scheduling the first data channel, and the first data channel is transmitted in a second period of time; receiving or transmitting data corresponding to the terminal device in the first data channel according to the scheduling information for the terminal device; wherein the first data channel and the second control channel are frequency division multiplexed in part time of the second period of time, and the data channel scheduled by the second control channel does not include the first data channel, wherein a starting position of the part time is not earlier than an ending position of the first period of time.

[0021] Optionally, a starting position of the first period of time is earlier than a starting position of the second period of time, the first control channel between the starting position of the first period of time and the starting position of the second period of time, and a second data channel are frequency division multiplexed, and the second data channel is scheduled by a control channel before the first control channel.

[0022] Optionally, an ending position of the first period of time is earlier than or equal to a starting position of the second period of time.

[0023] Optionally, a starting position of the second control channel in the second period of time is later than the starting position of the second period of time, and/or, an ending position of the second control channel in the second period of time is earlier than an ending position of the second period of time.

[0024] Optionally, the second control channel is only transmitted in part time of the second period of time.

[0025] Optionally, a time difference between a starting position of the first period of time and a starting position of the second period of time is greater than or equal to the maximum value of multiple time differences, which may exist in a wireless communication process, between multiple control channels and their scheduled data channels.

[0026] Optionally, the method further includes: receiving indication information including information of a position of the second period of time relative to the first period of time and/or information of a length of the second period of time; wherein receiving or transmitting the data corresponding to the terminal device in the first data channel according to the scheduling information for the terminal device includes: receiving or transmitting the data corresponding to the terminal device in the first data channel according to the indication information and the scheduling information.

[0027] Optionally, the indication information is used for indicating a relative position of a starting position of the second period of time relative to a starting position of the first period of time, or for indicating a relative position of the starting position of the second period of time relative to the ending position of the first period of time.

[0028] Optionally, receiving the indication information includes receiving the indication information, wherein the indication information includes information of positions and/or lengths of transmission time corresponding to multiple data channels scheduled by multiple control channels, and the multiple control channels include the first control channel.

[0029] Optionally, receiving the indication information includes: receiving the indication information transmitted through a high-layer signaling or physical-layer control signaling.

[0030] In a fourth aspect, there is provided a wireless communication method including: receiving indication information including information of a position and/or a length of a data channel scheduled by a control channel; receiving or transmitting data corresponding to the terminal device in the data channel in a transmission time period of the data channel according to the indication information and the scheduling information for the terminal device in the control channel.

[0031] Therefore, in the embodiment of the present application, a network device transmits indication information to a terminal device, and the indication information includes information of a position and/or a length of a transmission time period of a data channel scheduled by a control channel, and the network device may schedule the data channel according to the indication information, thereby realizing flexible scheduling of the data channel.

[0032] Optionally, the indication information is used for indicating a relative position of a starting position of the transmission time period of the data channel relative to a starting position of a transmission time period of the control channel; or, a relative position of a starting position of the transmission time period of the data channel relative to an ending position of a transmission time period of the control channel.

[0033] Optionally, receiving the indication information includes receiving the indication information, wherein the indication information includes information of positions and/or lengths of transmission time corresponding to multiple data channels scheduled by multiple control channels, and the multiple control channels include the control channel.

[0034] Optionally, receiving the indication information includes: receiving the indication information transmitted through a high-layer signaling or physical-layer signaling.

[0035] In a fifth aspect, there is provided a network device, and the network device may include units that perform the method of the first aspect or the method in any one of optional implementations of the first aspect.

[0036] In a sixth aspect, there is provided a network device, and the network device may include units that perform the method of the second aspect or the method in any one of optional implementations of the second aspect.

[0037] In a seventh aspect, there is provided a terminal device, and the network device may include units that perform the method of the third aspect or the method in any one of optional implementations of the third aspect.

[0038] In an eighth aspect, there is provided a terminal device, and the network device may include units that perform the method of the fourth aspect or the method in any one of optional implementations of the fourth aspect.

[0039] In a ninth aspect, there is provided a network device, and the network device may include a memory and a processor, the memory stores instructions, and the memory is used for calling the instructions stored in the memory to perform the method in the first aspect or any optional implementation thereof.

[0040] In a tenth aspect, there is provided a network device, and the network device may include a memory and a processor, the memory stores instructions, and the memory is used for calling the instructions stored in the memory to perform the method in the second aspect or any optional implementation thereof.

[0041] In an eleventh aspect, there is provided a terminal device, which may include a memory and a processor, the memory stores instructions, and the memory is used for calling the instructions stored in the memory to perform the method in the third aspect or any optional implementation thereof.

[0042] In a twelfth aspect, there is provided a terminal device, which may include a memory and a processor, the memory stores instructions, and the memory is used for calling the instructions stored in the memory to perform the method in the fourth aspect or any optional implementation thereof.

[0043] In a thirteenth aspect, a computer readable medium is provided. The computer readable medium stores program codes executable by a terminal device, and the program codes include instructions for executing the method of the first aspect or the method in any one of the implementations of the first aspect.

[0044] In a fourteenth aspect, a computer readable medium is provided. The computer readable medium stores program codes executable by a network device, and the program codes include instructions for executing the method of the second aspect or the method in any one of the implementations of the second aspect.

[0045] In a fifteenth aspect, a computer readable medium is provided. The computer readable medium stores program codes executable by a terminal device, and the program codes include instructions for executing the method of the third aspect or the method in any one of the implementations of the third aspect.

[0046] In a sixteenth aspect, a computer readable medium is provided. The computer readable medium stores program codes executable by a network device, and the program codes include instructions for executing the method of the fourth aspect or the method in any one of the implementations of the fourth aspect.

[0047] In a seventeenth aspect, there is provided a system chip including an input interface, an output interface, a processor and a memory, and the processor is used for executing codes in the memory, and when the codes are executed, the processor may implement the methods in the first aspect and any one of implementations.

[0048] In an eighteenth aspect, there is provided a system chip including an input interface, an output interface, a processor and a memory, and the processor is used for executing codes in the memory, and when the codes are executed, the processor may implement the methods in the second aspect and any one of implementations.

[0049] In a nineteenth aspect, there is provided a system chip including an input interface, an output interface, a processor and a memory, and the processor is used for executing codes in the memory, and when the codes are executed, the processor may implement the methods in the third aspect and any one of implementations.

[0050] In a twentieth aspect, there is provided a system chip including an input interface, an output interface, a processor and a memory, and the processor is used for executing codes in the memory, and when the codes are executed, the processor may implement the methods in the fourth aspect and any one of implementations.

Brief Description of Drawings

[0051] To describe technical schemes of embodiments of the present application more clearly, drawings that need to be used in the description of the embodiments or the related art will be briefly introduced below. It is apparent that the drawings described below are only

some embodiments of the present application; and for those of ordinary skill in the art, other drawings may be obtained according to these drawings without paying an inventive effort.

FIG. 1 is a diagram of an application scenario according to an embodiment of the present application.

FIG. 2 is a schematic flowchart of a wireless communication method according to an embodiment of the present application.

FIG. 3 is a schematic flowchart of a wireless communication method according to an embodiment of the present application.

FIG. 4 is a diagram of relationship of a control channel and a data channel in a time domain according to an embodiment of the present application.

FIG. 5a is a schematic diagram of a scheduling manner of a control channel to a data channel according to an embodiment of the present application.

FIG. 5b is a schematic diagram of symbols required to be pre-stored by a terminal device using the scheduling manner shown in FIG. 5a.

FIG. 5c is a schematic diagram according to a typical scheduling manner of a control channel to a data channel.

FIG. 5d is a schematic diagram of symbols required to be pre-stored by a terminal device using the scheduling manner shown in FIG. 5c.

FIG. 6 is a schematic flowchart of a wireless communication method according to an embodiment of the present application.

FIG. 7 is a schematic flowchart of a wireless communication method according to an embodiment of the present application.

FIG. 8 is a schematic block diagram of a network device according to an embodiment of the present application.

FIG. 9 is a schematic block diagram of a network device according to an embodiment of the present application.

FIG. 10 is a schematic block diagram of a terminal device according to an embodiment of the present application.

FIG. 11 is a schematic block diagram of a terminal device according to an embodiment of the present application.

FIG. 12 is a schematic block diagram of a communication device according to an embodiment of the present application.

FIG. 13 is a schematic block diagram of a system chip according to an embodiment of the present application.

Detailed Description

[0052] The technical solutions in the embodiments of the present application are described in the following with reference to the drawings in the embodiments of the present application. It is apparent that the embodiments described below are only part, but not all, of the embodiments of the present application. All other embodiments obtained by those skilled in the art based on the embodiments of the present application without paying an inventive effort are within the protection scope of the present application.

[0053] The technical solutions of the embodiments of the present application may be applied to various communication systems, such as a Global System of Mobile communication (GSM), a Code Division Multiple Access (CDMA) system, a Wideband Code Division Multiple Access (WCDMA) system, a General Packet Radio Service (GPRS) system, a Long Term Evolution (LTE) system, an LTE Frequency Division Duplex (FDD) system, an LTE Time Division Duplex (TDD) system, a Universal Mobile Telecommunication System (UMTS), a Worldwide Interoperability for Microwave Access (WiMAX) communication system, or a future 5G system.

[0054] FIG. 1 shows a wireless communication system 100 to which an embodiment of the present application is applied. The wireless communication system 100 may include a network device 110. The network device 100 may be a device that communicates with a terminal device. The network device 100 may provide communication coverage for a specific geographical area and may communicate with terminal devices (e.g., UEs) located within the coverage area. Optionally, the network device 100 may be a Base Transceiver Station (BTS) in a GSM system or CDMA system, a NodeB (NB) in a WCDMA system, an Evolutional Node B (eNB or eNodeB) in an LTE system, or a radio controller in a Cloud Radio Access Network (CRAN). Or, the network device may be a relay station, an access point, an on-board device, or a wearable device, a network side device in a future 5G network, or a network device in a future evolved Public Land Mobile Network (PLMN), etc.

[0055] The wireless communication system 100 further includes at least one terminal device 120 located within the coverage area of the network device 110. The terminal device 120 may be mobile or fixed. Optionally, the terminal device 120 may be referred to as an access terminal, a User Equipment (UE), a subscriber unit, a

subscriber station, a mobile station, a mobile platform, a remote station, a remote terminal, a mobile device, a user terminal, a terminal, a wireless communication device, a user agent, or a user device. The access terminal may be a cellular phone, a cordless phone, a Session Initiation Protocol (SIP) phone, a Wireless Local Loop (WLL) station, a Personal Digital Assistant (PDA), a handheld device with a wireless communication function, a computing device, or other processing devices connected to a wireless modem, an on-board device, a wearable device, a terminal device in a future 5G network, or a terminal device in a future evolved PLMN, or the like.

[0056] Optionally, the 5G system or network may also be referred to as a New Radio (NR) system or network.

[0057] FIG. 1 exemplifies one network device and two terminal devices. Optionally, the wireless communication system 100 may include multiple network devices and other quantities of terminal devices may be included within a coverage area of each network device. The embodiments of the present application are not limited thereto.

[0058] Optionally, the wireless communication system 100 may include other network entities such as a network controller, and a mobility management entity. The embodiments of the present application are not limited thereto.

[0059] It should be understood that the terms "system" and "network" are often used interchangeably herein. The term "and/or" in this document is merely an association relationship describing associated objects, indicating that there may be three relationships, for example, A and/or B, which may indicate three situations: A alone, A and B, and B alone. In addition, the symbol "/" in this document generally indicates that objects of the former and the latter connected by "/" has an "or" relationship.

[0060] FIG. 2 is a schematic flowchart of a wireless communication method 200 according to an embodiment of the present application. The method may optionally be performed by a network device.

[0061] As shown in FIG. 2, the method 200 includes acts 210-230.

[0062] In 210, a first control channel is transmitted in a first period of time, wherein the first control channel carries scheduling information of a first data channel.

[0063] In 220, the first data channel is received or transmitted in a second period of time according to the scheduling information of the first data channel.

[0064] In 230, a second control channel is transmitted in a frequency division multiplexing manner with the first data channel in part time of the second period of time, and a data channel scheduled by the second control channel does not include the first data channel, wherein a starting position of the part time is not earlier than an ending position of the first period of time.

[0065] FIG. 3 is a schematic flowchart of a communication method 300 according to an embodiment of the present application. The method may optionally be performed by a terminal device. As shown in FIG. 3, the method includes the following acts 310 and 320.

[0066] In 310, on a first control channel transmitted in a first period of time, a terminal device receives scheduling information corresponding to the terminal device in scheduling information of the first data channel, and the first control channel is used for scheduling the first data channel, and the first data channel is transmitted in a second period of time.

[0067] In 320, according to the scheduling information for the terminal device, data corresponding to the terminal device in the first data channel is received or transmitted; wherein the first data channel and a second control channel are frequency division multiplexed in part time of the second period of time, and a data channel scheduled by the second control channel does not include the first data channel, wherein a starting position of the part time is not earlier than an ending position of the first period of time.

[0068] Therefore, in an embodiment of the present application, a network device transmits a first control channel during a first period of time, and may schedule a first data channel transmitted during a second period of time, wherein a second control channel is transmitted in a frequency division multiplexing manner with the first data channel in part time of the second period of time, and a data channel scheduled by the second control channel does not include the first data channel, wherein a starting position of the part time is not earlier than an ending position of the first period of time. That is to say, the data channel that is frequency division multiplexed with the second control channel may be completely or partially scheduled by a control channel before the second control channel, thereby preventing a terminal device from caching too many data symbols, thereby reducing the requirement on the capability of the terminal device for receiving signals, reducing the processing burden of the terminal device, and reducing the battery consumption of the terminal device.

[0069] Optionally, the first control channel may be a Physical Downlink Control Channel (PDCCH).

[0070] Optionally, the first data channel may be a Physical Uplink Shared Channel (PUSCH) or a Physical Downlink Shared Channel (PDSCH).

[0071] Optionally, the first control channel may occupy at least one symbol of at least one time domain unit. For example, first few symbols of a subframe or slot may be occupied.

[0072] Optionally, the first control channel may occupy at least one symbol of at least one time domain unit. For example, multiple symbols of two adjacent time domain units may be occupied, for example, symbols that are later in time of a former time domain unit are occupied and symbols that are earlier in time of a latter time domain unit are occupied.

[0073] Optionally, time domain units occupied by the first control channel may be completely different from time domain units occupied by the first data channel.

[0074] Optionally, in the embodiment of the present application, time occupied by a data channel scheduled

once through a control channel may be referred to as a time domain unit corresponding to the data channel; or, an interval between two data channels scheduled twice through control channels is referred to as a time domain unit corresponding to the data channel.

[0075] Optionally, time occupied by a control channel may be referred to as a time domain unit corresponding to the control channel; or, an interval between two control channels is referred to as a time domain unit corresponding to the control channel.

[0076] Optionally, a duration jointly occupied by a control channel and a data channel scheduled by the control channel may be referred to as a time domain unit; or, a time domain unit is divided by a fixed duration within which a control channel or part of a data channel scheduled by the control channel may be transmitted.

[0077] It should be understood that a time domain unit may be called differently for different situations, for example, a time domain unit corresponding to a data channel is called a time domain scheduling unit. Of course, a duration jointly occupied by a control channel and a data channel scheduled by the control channel may be called a time domain scheduling unit. It is not specifically limited in the embodiments of the present application.

[0078] Optionally, the time domain unit mentioned in the embodiments of the present application may be a subframe or a time slot, but is not limited thereto.

[0079] Optionally, a starting position of the first period of time is earlier than a starting position of the second period of time, the first control channel between the starting position of the first period of time and the starting position of the second period of time, and the second data channel are frequency division multiplexed, and the second data channel is scheduled by a control channel before the first control channel.

[0080] That is, a data channel which is frequency division multiplexed with a first control channel may also be scheduled by a control channel before the first control channel.

[0081] Optionally, an ending position of the first period of time is earlier than or equal to a starting position of the second period of time.

[0082] When the ending position of the first period of time is earlier than the starting position of the second period of time, a time interval between the ending position and the starting position may be determined according to specific circumstances.

[0083] For example, in one implementation, the time interval between the ending position and the starting position may be greater than or equal to demodulation time of a first control channel, that is, a first data channel is transmitted after demodulation of the control channel is completed.

[0084] For example, in another implementation, an interval between starting time of a first control channel and starting time of a first data channel is greater than or equal to the maximum transmission duration of all possible control channels. If a transmission duration of the first control channel is not the maximum transmission duration, an ending position of the first control channel has a certain time interval with an ending position of the first data channel.

[0085] Optionally, a starting position of the second control channel in the second period of time is later than the starting position of the second period of time, and/or, an ending position of the second control channel in the second period of time is earlier than an ending position of the second period of time.

[0086] Optionally, the second control channel is only transmitted in part time of the second period of time.

[0087] Optionally, a time difference between a starting position of the first period of time and a starting position of the second period of time is greater than or equal to the maximum value of multiple time differences, which may exist in a wireless communication process, between multiple control channels and their scheduled data channels.

[0088] Optionally, in the embodiment of the present application, a network device may transmit indication information to a terminal device, and the indication information includes information of a position of the second period of time relative to the first period of time and/or information of a length of the second period of time.

[0089] In one implementation, the indication information is transmitted, and the indication information includes information of positions and/or lengths of transmission time corresponding to multiple data channels scheduled by multiple control channels, and the multiple control channels include the first control channel.

[0090] In another implementation, the indication information is transmitted, and the indication information only includes information of a position and/or a length of the transmission time corresponding to the first data channel.

[0091] Optionally, the indication information is used for indicating a relative position of a starting position of the second period of time relative to a starting position of the first period of time, or for indicating a relative position of the starting position of the second period of time relative to an ending position of the first period of time.

[0092] Of course, the indication information may include information such as an ending position of the second period of time, and will not be repeated here.

[0093] Optionally, the indication information is transmitted through a high-layer signaling or physical-layer control signaling.

[0094] Optionally, in the embodiment of the present application, a network device may transmit indication information in a dynamic or semi-static manner, wherein the dynamic manner is that the indication information each time only carries information of a position and/or a length of transmission time of a data channel corresponding to one control channel; and the semi-static manner is that the indication information each time may carry information of positions and/or lengths of data channels respectively corresponding to multiple control channels.

[0095] The indication information may be transmitted

semi-statically through a high-layer signaling, or the indication information may be transmitted dynamically through a physical-layer control signaling.

[0096] Optionally, the high-layer signaling may be a Radio Resource Control (RRC) message, or System Information (SI).

[0097] Optionally, the physical-layer control signaling may be Downlink control information (DCI).

[0098] In order to facilitate a clearer understanding of the present application, a scheduling method according to an embodiment of the present application will be described below with reference to FIGs. 4 and 5a-5d.

[0099] As shown in FIG. 4, assuming that a transmission cycle of a control channel is P symbols (i.e., an interval of symbols between two control channels), the nth control channel is located from symbol 1 to symbol c1, and the n+lth control channel is distributed from symbol P+1 to symbol 1+P+c2, then the nth data channel is distributed from symbol d1 to symbol d2, and d1>c1, d2>1+P+c2, and the nth data channel is scheduled by the nth control channel. Similarly, a scheduling manner of the n+1th data channel and that of the n-1th data channel are similar.

[0100] As shown in FIG. 5a, control channel 1 may schedule data channel a1, control channel 2 may schedule data channel d1, control channel 3 may schedule data channel b1 and data channel e1, control channel 4 may schedule data channel c1, data channel f, and data channel i1, control channel 5 may schedule data channel g1, control channel 6 may schedule data channel h1 and data channel m1, control channel 7 may schedule data channel k1, and control channel 8 may schedule data channel n1.

[0101] Using the scheduling method shown in FIG. 5a, FIG. 5b shows the quantity of symbols that a terminal needs to pre-cache when the terminal device decodes the control channels 3 and 6. As shown in FIG. 5b, a duration required for caching a data channel is a decoding duration t1 of a control channel, and the quantity of symbols to be pre-cached by the terminal is x.

[0102] FIG. 5c shows a conventional scheduling method.

[0103] As shown in FIG. 5c, control channel 1 may schedule data channel a2, control channel 2 may schedule data channel d2, control channel 3 may schedule data channel b2 and data channel e2, control channel 4 may schedule data channel c2, data channel f, and data channel i2, control channel 5 may schedule data channel g2, control channel 6 may schedule data channel h2 and data channel m2, control channel 7 may schedule data channel k2, and control channel 8 may schedule data channel n2.

[0104] FIG. 5d shows, using the scheduling method shown in FIG. 5c, the quantity of symbols that a terminal needs to pre-cache when the terminal device decodes the control channels 3 and 6. As shown in FIG. 5d, a duration required for caching a data channel is a sum of a decoding duration t1 of a control channel and a transmission duration t2 of the control channel, the quantity of symbols to be pre-cached by the terminal is y, wherein the quantity of symbols y is significantly greater than the quantity of symbols x.

[0105] As may be seen from FIGs. 5b and 5d, by adopting the scheduling method of the present application, the quantity of symbols that a terminal device needs to cache may be reduced.

[0106] FIG. 6 is a schematic flowchart of a communication method 400 according to an embodiment of the present application. As shown in FIG. 6, the method 400 includes acts 410-430. The method is optionally performed by a network device.

[0107] In 410, indication information including information of a position and/or length of a transmission time period of a data channel scheduled by a control channel is transmitted.

[0108] Optionally, the indication information is transmitted to a terminal device.

[0109] In 420, the control channel is transmitted.

[0110] Optionally, the control channel is transmitted to the terminal device.

[0111] In 430, during the transmission time period of the data channel, reception or transmission of the data channel is performed.

[0112] Optionally, during the transmission time period of the data channel, reception and transmission of the data channel is performed with the terminal device.

[0113] FIG. 7 is a schematic flowchart of a communication method 500 according to an embodiment of the present application. As shown in FIG. 7, the method 500 includes acts 510-520. The method is optionally performed by a terminal device.

[0114] In 510, indication information including information of a position and/or length of a data channel scheduled by a control channel is received.

[0115] Optionally, indication information transmitted by a network device is received.

[0116] In 520, according to the indication information and scheduling information for the terminal device in the control channel, data corresponding to the terminal device in the data channel is received or transmitted during a transmission time period of the data channel.

[0117] Optionally, the indication information is used for indicating a relative position of a starting position of the transmission time period of the data channel relative to a starting position of a transmission time period of the control channel; or, a relative position of a starting position of the transmission time period of the data channel relative to an ending position of the transmission time period of the control channel.

[0118] Optionally, the indication information is transmitted through a high-layer signaling or physical-layer control signaling.

[0119] Optionally, in the embodiment of the present application, a network device may transmit the indication information in a dynamic or semi-static manner, wherein the dynamic manner is that the indication information

each time only carries information of a position and/or a length of transmission time of a data channel corresponding to one control channel; and the semi-static manner is that the indication information each time may carry information of positions and/or lengths of data channels respectively corresponding to multiple control channels, wherein the indication information may be transmitted semi-statically through a high-layer signaling, or the indication information may be transmitted dynamically through a physical-layer control signaling.

[0120] Optionally, the high-layer signaling may be a Radio Resource Control (RRC) message, or System Information (SI).

[0121] Optionally, the physical-layer control signaling may be Downlink control information (DCI).

[0122] Therefore, in the embodiment of the present application, a network device transmits indication information to a terminal device, and the indication information includes information of a position and/or a length of a transmission time period of a data channel scheduled by a control channel, and the network device may schedule the data channel according to the indication information, thereby realizing flexible scheduling of the data channel.

[0123] FIG. 8 is a schematic block diagram of a network device 600 according to an embodiment of the present application. As shown in FIG. 8, the network device 600 includes a first transceiving unit 610 and a second transceiving unit 620. The first transceiving unit 610 is used for transmitting a first control channel in a first period of time, wherein the first control channel carries scheduling information of a first data channel; the second transceiving unit 620 is used for receiving or transmitting the first data channel in a second period of time according to the scheduling information of the first data channel; the first transceiving unit 610 is further used for transmitting a second control channel in a frequency division multiplexing manner with the first data channel in part time of the second period of time; a data channel scheduled by the second control channel does not include the first data channel, wherein a starting position of the part time is not earlier than an ending position of the first period of time.

[0124] Optionally, a starting position of the first period of time is earlier than a starting position of the second period of time, the first control channel between the starting position of the first period of time and the starting position of the second period of time, and a second data channel are frequency division multiplexed, and the second data channel is scheduled by a control channel before the first control channel.

[0125] Optionally, an ending position of the first period of time is earlier than or equal to a starting position of the second period of time.

[0126] Optionally, a starting position of the second control channel in the second period of time is later than the starting position of the second period of time, and/or, an ending position of the second control channel in the second period of time is earlier than an ending position of the second period of time.

[0127] Optionally, the second control channel is only transmitted in part time of the second period of time.

[0128] Optionally, a time difference between a starting position of the first period of time and a starting position of the second period of time is greater than or equal to the maximum value of multiple time differences, which may exist in a wireless communication process, between multiple control channels and their scheduled data channels.

[0129] Optionally, the first transceiving unit 610 is further used for transmitting indication information including information of a position of the second period of time relative to the first period of time and/or information of a length of the second period of time.

[0130] Optionally, the indication information is used for indicating a relative position of a starting position of the second period of time relative to a starting position of the first period of time, or for indicating a relative position of the starting position of the second period of time relative to the ending position of the first period of time.

[0131] Optionally, the first transceiving unit 610 is further used for transmitting the indication information, wherein the indication information includes information of positions and/or lengths of transmission time corresponding to multiple data channels scheduled by multiple control channels, and the multiple control channels include the first control channel.

[0132] Optionally, the first transceiving unit 610 is further used for transmitting the indication information through a high-layer signaling or physical-layer control signaling.

[0133] It should be understood that the network device may correspond to the network device in the method 200, and may realize corresponding operations of the network device in the method 200. For the sake of brevity, it will not be repeated here.

[0134] FIG. 9 is a schematic block diagram of a network device 700 according to an embodiment of the present application. As shown in FIG. 9, the network device 700 includes a first transceiving unit 710 and a second transceiving unit 720. The first transceiving unit 710 is used for transmitting indication information including information of a position and/or length of a transmission time period of a data channel scheduled by a control channel; transmitting the control channel; the second transceiving unit 720 is used for receiving or transmitting the data channel during the transmission time period of the data channel.

[0135] Optionally, the indication information is used for indicating a relative position of a starting position of the transmission time period of the data channel relative to a starting position of a transmission time period of the control channel; or, a relative position of a starting position of the transmission time period of the data channel relative to an ending position of a transmission time period of the control channel.

[0136] Optionally, the first transceiving unit 710 is fur-

ther used for transmitting the indication information, wherein the indication information includes information of positions and/or lengths of transmission time corresponding to multiple data channels scheduled by multiple control channels, and the multiple control channels include the control channel.

[0137] Optionally, the first transceiving unit 710 is further used for transmitting the indication information through a high-layer signaling or physical-layer signaling.

[0138] It should be understood that the network device may correspond to the network device in the method 400, and may realize corresponding operations of the network device in the method 400. For the sake of brevity, the description thereof will not be repeated here.

[0139] FIG. 10 is a schematic block diagram of a terminal device 800 according to an embodiment of the present application. As shown in FIG. 10, the terminal device 800 includes a first transceiving unit 810 and a second transceiving unit 820; the first transceiving unit 810 is used for receiving scheduling information corresponding to the terminal device in scheduling information of a first data channel on a first control channel transmitted in a first period of time, wherein the first control channel is used for scheduling the first data channel, and the first data channel is transmitted in a second period of time; the second transceiving unit 820 is used for receiving or transmitting data corresponding to the terminal device in the first data channel according to the scheduling information for the terminal device; wherein the first data channel and a second control channel are frequency division multiplexed in part time of the second period of time, and a data channel scheduled by the second control channel does not include the first data channel, wherein a starting position of the part time is not earlier than an ending position of the first period of time.

[0140] Optionally, a starting position of the first period of time is earlier than a starting position of the second period of time, the first control channel between the starting position of the first period of time and the starting position of the second period of time, and a second data channel are frequency division multiplexed, and the second data channel is scheduled by a control channel before the first control channel.

[0141] Optionally, an ending position of the first period of time is earlier than or equal to the starting position of the second period of time.

[0142] Optionally, a starting position of the second control channel in the second period of time is later than the starting position of the second period of time, and/or, an ending position of the second control channel in the second period of time is earlier than an ending position of the second period of time.

[0143] Optionally, the second control channel is only transmitted in part time of the second period of time.

[0144] Optionally, a time difference between the starting position of the first period of time and the starting position of the second period of time is greater than or equal to the maximum value of multiple time differences, which may exist in a wireless communication process, between multiple control channels and their scheduled data channels.

[0145] Optionally, the first transceiving unit 810 is further used for receiving indication information including information of a position of the second period of time relative to the first period of time and/or information of a length of the second period of time; the second transceiving unit 820 is further used for receiving or transmitting data corresponding to the terminal device in the first data channel according to the indication information and the scheduling information.

[0146] Optionally, the indication information is used for indicating a relative position of a starting position of the second period of time relative to a starting position of the first period of time, or for indicating a relative position of the starting position of the second period of time relative to the ending position of the first period of time.

[0147] Optionally, the first transceiving unit 810 is further used for receiving the indication information, wherein the indication information includes information of positions and/or lengths of transmission time corresponding to multiple data channels scheduled by multiple control channels, and the multiple control channels include the first control channel.

[0148] Optionally, the first transceiving unit 810 is further used for receiving the indication information transmitted through a high-layer signaling or physical-layer control signaling.

[0149] It should be understood that the terminal device may correspond to the terminal device in the method 300, and may implement corresponding operations of the terminal device in the method 300. For the sake of brevity, it will not be repeated here.

[0150] FIG. 11 is a schematic block diagram of a terminal device 900 according to an embodiment of the present application. As shown in FIG. 11, the terminal device 900 includes a first transceiving unit 910 and a second transceiving unit 920; wherein, optionally the first transceiving unit 910 is used for receiving indication information including information of a position and/or a length of a data channel scheduled by a control channel; the second transceiving unit 920 is used for receiving or transmitting data corresponding to the terminal device in the data channel in a transmission time period of the data channel according to the indication information and scheduling information for the terminal device in the control channel.

[0151] Optionally, the indication information is used for indicating a relative position of a starting position of a transmission time period of the data channel relative to a starting position of a transmission time period of the control channel; or, a relative position of a starting position of a transmission time period of the data channel relative to an ending position of a transmission time period of the control channel.

[0152] Optionally, the first transceiving unit 910 is further used for receiving the indication information, wherein

the indication information includes information of positions and/or lengths of transmission time corresponding to multiple data channels scheduled by multiple control channels, and the multiple control channels include the control channel.

[0153] Optionally, the first transceiving unit 910 is further used for receiving the indication information transmitted through a high-layer signaling or physical-layer signaling.

[0154] It should be understood that the terminal device may correspond to the terminal device in the method 500, and may implement corresponding operations of the terminal device in the method 500. For the sake of brevity, the description thereof will not be repeated here.

[0155] FIG. 12 is a schematic block diagram of a communication device 1000 according to an embodiment of the present application. As shown in FIG. 12, the device 1000 may include a processor 1010 and a memory 1020. The memory 1020 may store program codes, and the processor 1010 may execute the program codes stored in the memory 1020.

[0156] Optionally, as shown in FIG. 12, the device 1000 may include a transceiver 1030, and the processor 1010 may control the transceiver 1030 to communicate externally.

[0157] Optionally, the processor 1010 may call the program codes stored in the memory 1020 to perform corresponding operations of the network device in the method 200 shown in FIG. 2, which will not be described here repeatedly for brevity.

[0158] Optionally, the processor 1010 may call the program codes stored in the memory 1020 to perform corresponding operations of the terminal device in the method 300 shown in FIG. 3, which will not be described here repeatedly for brevity.

[0159] Optionally, the processor 1010 may call the program codes stored in the memory 1020 to perform corresponding operations of the network device in the method 400, which will not be described here repeatedly for brevity.

[0160] Optionally, the processor 1010 may call the program codes stored in the memory 1020 to perform corresponding operations of the terminal device in the method 500 shown in FIG. 7, which will not be described here repeatedly for brevity.

[0161] FIG. 13 is a schematic structural diagram of a system chip according to an embodiment of the present application. The system chip 1100 of FIG. 13 includes an input interface 1101, an output interface 1102, a processor 1103, and a memory 1104 which are connected by a communication connection, and the processor 1103 is used for executing codes in the memory 1104.

[0162] Optionally, when the codes are executed, the processor 1103 implements the method executed by the terminal device in the method embodiment. For the sake of brevity, it will not be repeated here.

[0163] Optionally, when the codes are executed, the processor 1103 implements the method executed by the network device in the method embodiment. For the sake of brevity, it will not be repeated here.

[0164] Those of ordinary skill in the art will recognize that various exemplary units and algorithm acts described in the embodiments disclosed herein may be realized in electronic hardware, or a combination of computer software and electronic hardware. Whether these functions are performed in hardware or software depends on specific applications and design constraints of the technical solution. Skilled artisans may use different methods to implement the described functions for each particular application, but such implementation should not be considered to be beyond the scope of the present application.

[0165] Those skilled in the art may clearly understand that for convenience and conciseness of description, the specific working processes of the system, device and unit described above may refer to the corresponding processes in the aforementioned method embodiments and will not be described here.

[0166] In several embodiments provided by the present application, it should be understood that the disclosed systems, devices and methods may be implemented in other ways. For example, the apparatus embodiments described above are only illustrative, for example, the division of the units is only a logical function division, and there may be other division manners in actual implementation, for example, multiple units or components may be combined or integrated into another system, or some features may be ignored or not executed. On the other hand, the mutual coupling or direct coupling or communication connection shown or discussed may be indirect coupling or communication connection through some interface, device or unit, and may be in electrical, mechanical or other forms.

[0167] The unit described as a separate component may or may not be physically separated, and the component shown as a unit may or may not be a physical unit, i.e., it may be located in one place or may be distributed over multiple network units. Some or all of the units may be selected according to actual needs to achieve the purpose of solutions of the embodiments of the present application.

[0168] In addition, various functional units in various embodiments of the present application may be integrated in one processing unit, or the various units may be physically present separately, or two or more units may be integrated in one unit.

[0169] The functions may be stored in a computer readable memory medium if realized in a form of software functional units and sold or used as a separate product. Based on this understanding, the technical solution of the present application, in essence, or the part contributing to the prior art, or the part of the technical solution, may be embodied in the form of a software product stored in a storage medium, including a number of instructions for causing a computer device (which may be a personal computer, a server, or a network device and the like) to

perform all or part of the acts of the method described in various embodiments of the present application. The aforementioned storage medium includes U disk, mobile hard disk, read-only memory (ROM), random access memory (RAM), magnetic disk or optical disk, and other medium capable of storing program codes.

[0170] What are described above are merely exemplary embodiments of the present application, but the protection scope of the present application is not limited thereto. Any variation or substitution that may be easily conceived by a person skilled in the art within the technical scope disclosed by the present application shall be included within the protection scope of the present application. Therefore, the protection scope of the present application shall be determined by the protection scope of the claims.

Claims

1. A method for wireless communication, comprising:

transmitting a first control channel in a first period of time, wherein the first control channel carries scheduling information of a first data channel;
receiving or transmitting the first data channel in a second period of time according to the scheduling information of the first data channel; and
transmitting a second control channel in a frequency division multiplexing manner with the first data channel in part time of the second period of time, wherein a data channel scheduled by the second control channel does not comprise the first data channel, and a starting position of the part time is not earlier than an ending position of the first period of time.

2. The method according to claim 1, wherein a starting position of the first period of time is earlier than a starting position of the second period of time, the first control channel between the starting position of the first period of time and the starting position of the second period of time, and a second data channel are frequency division multiplexed, and the second data channel is scheduled by a control channel before the first control channel.

3. The method according to claim 2, wherein the ending position of the first period of time is earlier than or equal to the starting position of the second period of time.

4. The method according to any one of claims 1-3, wherein a starting position of the second control channel in the second period of time is later than the starting position of the second period of time, and/or, an ending position of the second control channel in the second period of time is earlier than an ending position of the second period of time.

5. The method according to any one of claims 1-4, wherein the second control channel is only transmitted in the part time of the second period of time.

6. The method according to any one of claims 1-5, a time difference between the starting position of the first period of time and the starting position of the second period of time is greater than or equal to a maximum value of multiple time differences, which may exist in a wireless communication process, between multiple control channels and data channels scheduled by the multiple control channels.

7. The method according to any one of claims 1-6, wherein the method further comprises:
transmitting indication information comprising information of a position of the second period of time relative to the first period of time and/or information of a length of the second period of time.

8. The method according to claim 7, wherein the indication information is used for indicating a relative position of the starting position of the second period of time relative to the starting position of the first period of time, or for indicating a relative position of the starting position of the second period of time relative to the ending position of the first period of time.

9. The method according to claim 7 or 8, wherein transmitting the indication information comprises:
transmitting the indication information, wherein the indication information comprises information of positions and/or lengths of transmission time corresponding to multiple data channels scheduled by multiple control channels, and the multiple control channels comprise the first control channel.

10. The method according to any one of claims 7-9, wherein transmitting the indication information comprises:
transmitting the indication information through a high-layer signaling or physical-layer control signaling.

11. A method for wireless communication, comprising:

transmitting indication information, wherein the indication information comprises information of a position and/or length of a transmission time period of a data channel scheduled by a control channel;
transmitting the control channel; and
performing reception or transmission of the data channel during the transmission time period of

the data channel.

12. The method according to claim 11, wherein the indication information is used for indicating:

a relative position of a starting position of the transmission time period of the data channel relative to a starting position of a transmission time period of the control channel; or,
a relative position of a starting position of the transmission time period of the data channel relative to an ending position of a transmission time period of the control channel.

13. The method according to claim 11 or 12, wherein transmitting the indication information comprises:
transmitting the indication information, wherein the indication information comprises information of positions and/or lengths of transmission time corresponding to multiple data channels scheduled by multiple control channels, and the multiple control channels comprise the control channel.

14. The method according to any one of claims 11-13, wherein transmitting the indication information comprises:
transmitting the indication information through a high-layer signaling or physical-layer signaling.

15. A method for wireless communication, comprising:

receiving, by a terminal device, scheduling information corresponding to the terminal device in scheduling information of a first data channel on a first control channel transmitted in a first period of time, wherein the first control channel is used for scheduling the first data channel, and the first data channel is transmitted in a second period of time; and
receiving or transmitting data corresponding to the terminal device in the first data channel according to the scheduling information for the terminal device;
wherein the first data channel and a second control channel are frequency division multiplexed in part time of the second period of time, a data channel scheduled by the second control channel does not comprise the first data channel, and wherein a starting position of the part time is not earlier than an ending position of the first period of time.

16. The method according to claim 15, wherein a starting position of the first period of time is earlier than a starting position of the second period of time, the first control channel between the starting position of the first period of time and the starting position of the second period of time, and a second data channel are frequency division multiplexed, and the second data channel is scheduled by a control channel before the first control channel.

17. The method according to claim 16, wherein the ending position of the first period of time is earlier than or equal to the starting position of the second period of time.

18. The method according to any one of claims 15-17, wherein a starting position of the second control channel in the second period of time is later than the starting position of the second period of time, and/or, an ending position of the second control channel in the second period of time is earlier than an ending position of the second period of time.

19. The method according to any one of claims 15-18, wherein the second control channel is only transmitted in the part time of the second period of time.

20. The method according to any one of claims 15-19, a time difference between the starting position of the first period of time and the starting position of the second period of time is greater than or equal to a maximum value of multiple time differences, which may exist in a wireless communication process, between multiple control channels and data channels scheduled by the multiple control channels.

21. The method according to any one of claims 15-20, wherein the method further comprises:

receiving indication information comprising information of a position of the second period of time relative to the first period of time and/or information of a length of the second period of time;
wherein receiving or transmitting the data corresponding to the terminal device in the first data channel according to the scheduling information for the terminal device comprises:
receiving or transmitting the data corresponding to the terminal device in the first data channel according to the indication information and the scheduling information.

22. The method according to claim 21, wherein the indication information is used for indicating a relative position of the starting position of the second period of time relative to the starting position of the first period of time, or for indicating a relative position of the starting position of the second period of time relative to the ending position of the first period of time.

23. The method according to claim 21 or 22, wherein receiving the indication information comprises:
receiving the indication information, wherein the in-

dication information comprises information of positions and/or lengths of transmission time corresponding to multiple data channels scheduled by multiple control channels, and the multiple control channels comprise the first control channel.

24. The method according to any one of claims 21-23, wherein receiving the indication information comprises:
receiving the indication information transmitted through a high-layer signaling or physical-layer control signaling.

25. A method for wireless communication, comprising:

receiving indication information, wherein the indication information comprises information of a position and/or length of a data channel scheduled by a control channel; and
receiving or transmitting data corresponding to a terminal device in the data channel in a transmission time period of the data channel according to the indication information and scheduling information for the terminal device in the control channel.

26. The method according to claim 25, wherein the indication information is used for indicating:

a relative position of a starting position of the transmission time period of the data channel relative to a starting position of a transmission time period of the control channel; or,
a relative position of a starting position of the transmission time period of the data channel relative to an ending position of a transmission time period of the control channel.

27. The method according to claim 25 or 26, wherein receiving the indication information comprises:
receiving the indication information, wherein the indication information comprises information of positions and/or lengths of transmission time corresponding to multiple data channels scheduled by multiple control channels, and the multiple control channels comprise the control channel.

28. The method according to any one of claims 25-27, wherein receiving the indication information comprises:
receiving the indication information transmitted through a high-layer signaling or physical-layer signaling.

29. A network device, comprising a first transceiving unit and a second transceiving unit; wherein
the first transceiving unit is used for transmitting a first control channel in a first period of time, wherein the first control channel carries scheduling information of a first data channel;
the second transceiving unit is used for receiving or transmitting the first data channel in a second period of time according to the scheduling information of the first data channel;
the first transceiving unit is further used for transmitting a second control channel in a frequency division multiplexing manner with the first data channel in part time of the second period of time;
a data channel scheduled by the second control channel does not comprise the first data channel, wherein a starting position of the part time is not earlier than an ending position of the first period of time.

30. The network device according to claim 29, wherein a starting position of the first period of time is earlier than a starting position of the second period of time, the first control channel between the starting position of the first period of time and the starting position of the second period of time, and a second data channel are frequency division multiplexed, and the second data channel is scheduled by a control channel before the first control channel.

31. The network device according to claim 30, wherein the ending position of the first period of time is earlier than or equal to the starting position of the second period of time.

32. The network device according to any one of claims 29-31, wherein a starting position of the second control channel in the second period of time is later than the starting position of the second period of time, and/or, an ending position of the second control channel in the second period of time is earlier than an ending position of the second period of time.

33. The network device according to any one of claims 29-32, wherein the second control channel is only transmitted in the part time of the second period of time.

34. The network device according to any one of claims 29-33, a time difference between the starting position of the first period of time and the starting position of the second period of time is greater than or equal to a maximum value of multiple time differences, which may exist in a wireless communication process, between multiple control channels and data channels scheduled by the multiple control channels.

35. The network device according to any one of claims 29-34, wherein the first transceiving unit is further used for:
transmitting indication information comprising information of a position of the second period of time relative to the first period of time and/or information of

a length of the second period of time.

36. The network device according to claim 35, wherein the indication information is used for indicating a relative position of the starting position of the second period of time relative to the starting position of the first period of time, or for indicating a relative position of the starting position of the second period of time relative to the ending position of the first period of time.

37. The network device according to claim 35 or 36, wherein the first transceiving unit is further used for:
transmitting the indication information, wherein the indication information comprises information of positions and/or lengths of transmission time corresponding to multiple data channels scheduled by multiple control channels, and the multiple control channels comprise the first control channel.

38. The network device according to any one of claims 35-37, wherein the first transceiving unit is further used for:
transmitting the indication information through a high-layer signaling or physical-layer control signaling.

39. A network device, comprising a first transceiving unit and a second transceiving unit; wherein

the first transceiving unit is used for transmitting indication information, wherein the indication information comprises information of a position and/or length of a transmission time period of a data channel scheduled by a control channel; and transmitting the control channel;
the second transceiving unit is used for receiving or transmitting the data channel during the transmission time period of the data channel.

40. The network device according to claim 39, wherein the indication information is used for indicating:

a relative position of a starting position of the transmission time period of the data channel relative to a starting position of a transmission time period of the control channel; or,
a relative position of a starting position of the transmission time period of the data channel relative to an ending position of a transmission time period of the control channel.

41. The network device according to claim 39 or 40, wherein the first transceiving unit is further used for:
transmitting the indication information, wherein the indication information comprises information of positions and/or lengths of transmission time corresponding to multiple data channels scheduled by multiple control channels, and the multiple control channels comprise the control channel.

42. The network device according to any one of claims 39-41, wherein the first transceiving unit is further used for:
transmitting the indication information through a high-layer signaling or physical-layer signaling.

43. A terminal device, comprising a first transceiving unit and a second transceiving unit; wherein
the first transceiving unit is used for receiving scheduling information corresponding to the terminal device in scheduling information of a first data channel on a first control channel transmitted in a first period of time, wherein the first control channel is used for scheduling the first data channel, and the first data channel is transmitted in a second period of time;
the second transceiving unit is used for receiving or transmitting data corresponding to the terminal device in the first data channel according to the scheduling information for the terminal device;
wherein the first data channel and a second control channel are frequency division multiplexed in part time of the second period of time, and a data channel scheduled by the second control channel does not comprise the first data channel, wherein a starting position of the part time is not earlier than an ending position of the first period of time.

44. The terminal device according to claim 43, wherein a starting position of the first period of time is earlier than a starting position of the second period of time, the first control channel between the starting position of the first period of time and the starting position of the second period of time, and a second data channel are frequency division multiplexed, and the second data channel is scheduled by a control channel before the first control channel.

45. The terminal device according to claim 44, wherein the ending position of the first period of time is earlier than or equal to the starting position of the second period of time.

46. The terminal device according to any one of claims 43-45, wherein a starting position of the second control channel in the second period of time is later than the starting position of the second period of time, and/or, an ending position of the second control channel in the second period of time is earlier than an ending position of the second period of time.

47. The terminal device according to any one of claims 43-46, wherein the second control channel is only transmitted in the part time of the second period of time.

48. The terminal device according to any one of claims 43-47, a time difference between the starting position of the first period of time and the starting position of the second period of time is greater than or equal to a maximum value of multiple time differences, which may exist in a wireless communication process, between multiple control channels and data channels scheduled by the multiple control channels.

49. The terminal device according to any one of claims 43-48, wherein the first transceiving unit is further used for:

receiving indication information comprising information of a position of the second period of time relative to the first period of time and/or information of a length of the second period of time;
the second transceiving unit is further used for:
receiving or transmitting the data corresponding to the terminal device in the first data channel according to the indication information and the scheduling information.

50. The terminal device according to claim 49, wherein the indication information is used for indicating a relative position of the starting position of the second period of time relative to the starting position of the first period of time, or for indicating a relative position of the starting position of the second period of time relative to the ending position of the first period of time.

51. The terminal device according to claim 49 or 50, wherein the first transceiving unit is further used for:
receiving the indication information, wherein the indication information comprises information of positions and/or lengths of transmission time corresponding to multiple data channels scheduled by multiple control channels, and the multiple control channels comprise the first control channel.

52. The terminal device according to any one of claims 49-51, wherein the first transceiving unit is further used for:
receiving the indication information transmitted through a high-layer signaling or physical-layer control signaling.

53. A terminal device, comprising a first transceiving unit and a second transceiving unit; wherein
the first transceiving unit is used for receiving indication information, wherein the indication information comprises information of a position and/or length of a data channel scheduled by a control channel; and
the second transceiving unit is used for receiving or transmitting data corresponding to the terminal device in the data channel in a transmission time period of the data channel according to the indication information and scheduling information for the terminal device in the control channel.

54. The terminal device according to claim 53, wherein the indication information is used for indicating:

a relative position of a starting position of the transmission time period of the data channel relative to a starting position of a transmission time period of the control channel; or,
a relative position of a starting position of the transmission time period of the data channel relative to an ending position of a transmission time period of the control channel.

55. The terminal device according to claim 53 or 54, wherein the first transceiving unit is further used for:
receiving the indication information, wherein the indication information comprises information of positions and/or lengths of transmission time corresponding to multiple data channels scheduled by multiple control channels, and the multiple control channels comprise the control channel.

56. The terminal device according to any one of claims 53-55, wherein the first transceiving unit is further used for:
receiving the indication information transmitted through a high-layer signaling or physical-layer signaling.

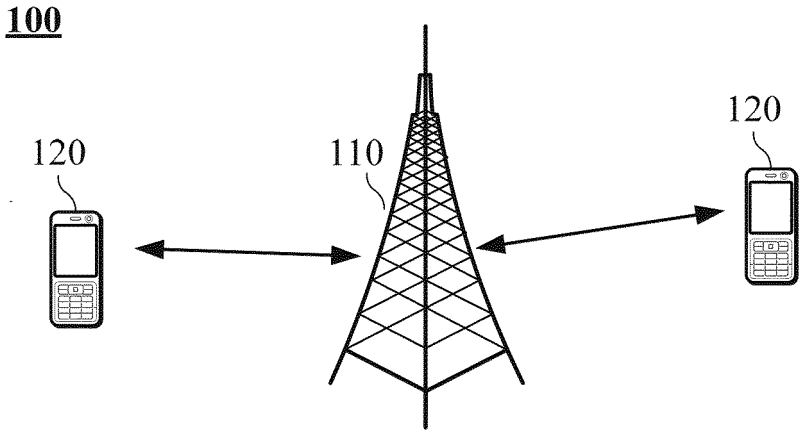
100
120
110
120

FIG. 1

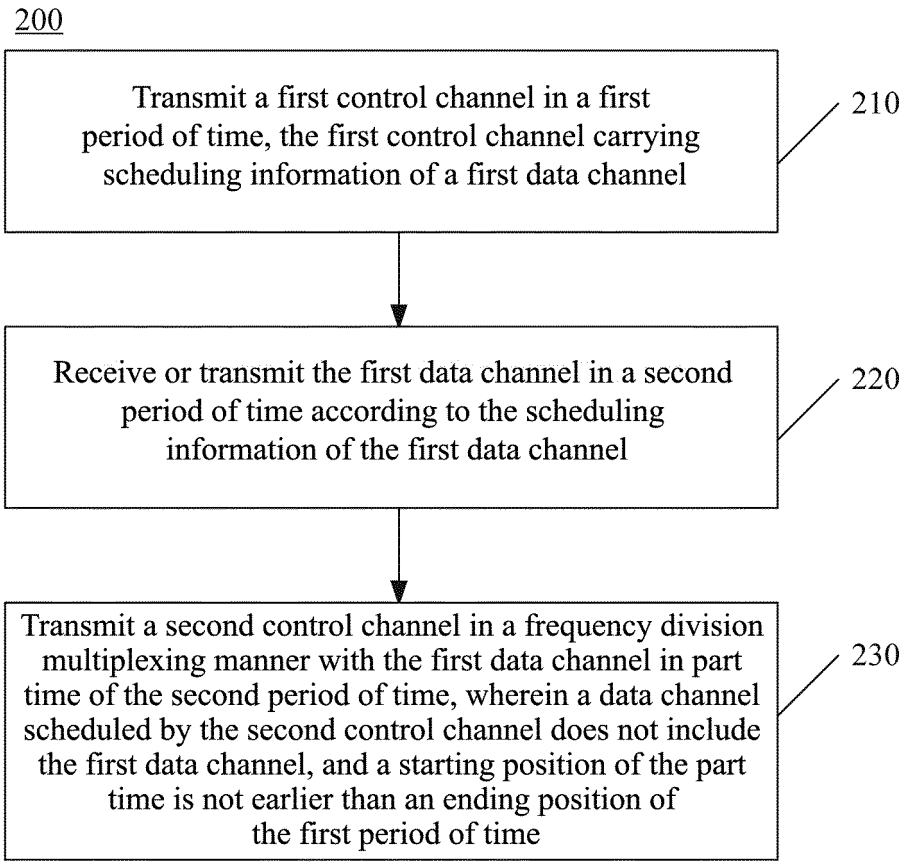
200
Transmit a first control channel in a first period of time, the first control channel carrying scheduling information of a first data channel
210
Receive or transmit the first data channel in a second period of time according to the scheduling information of the first data channel
220
Transmit a second control channel in a frequency division multiplexing manner with the first data channel in part time of the second period of time, wherein a data channel scheduled by the second control channel does not include the first data channel, and a starting position of the part time is not earlier than an ending position of the first period of time
230

FIG. 2

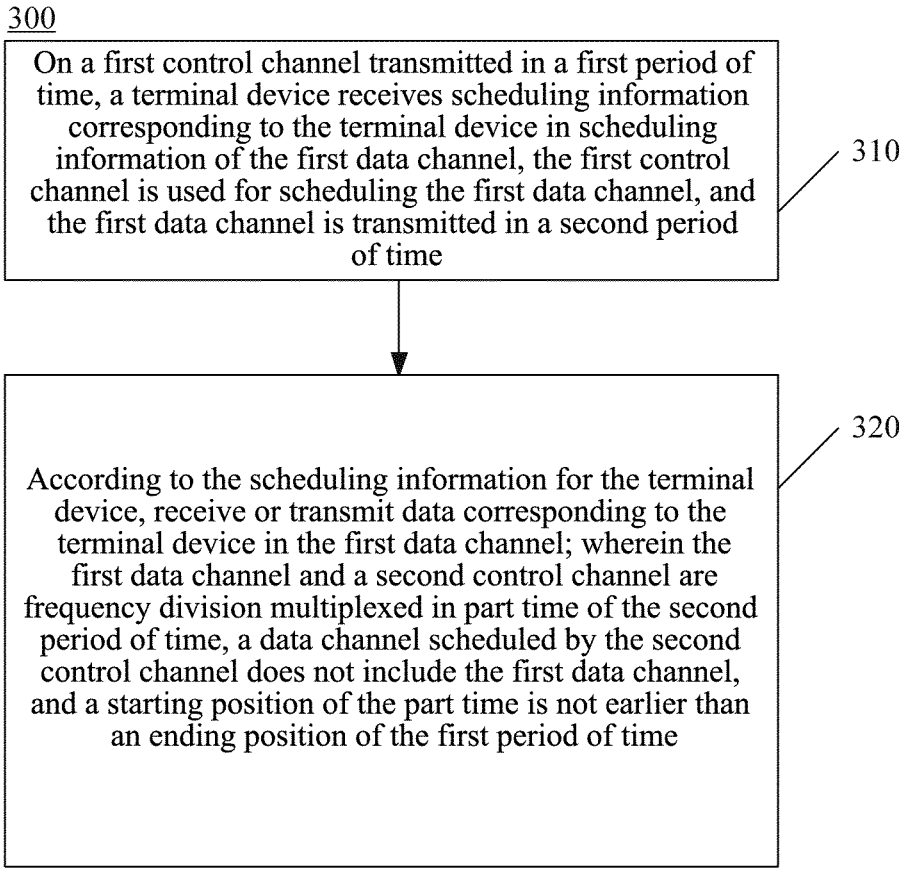
300
On a first control channel transmitted in a first period of time, a terminal device receives scheduling information corresponding to the terminal device in scheduling information of the first data channel, the first control channel is used for scheduling the first data channel, and the first data channel is transmitted in a second period of time
310
According to the scheduling information for the terminal device, receive or transmit data corresponding to the terminal device in the first data channel; wherein the first data channel and a second control channel are frequency division multiplexed in part time of the second period of time, a data channel scheduled by the second control channel does not include the first data channel, and a starting position of the part time is not earlier than an ending position of the first period of time
320

FIG. 3

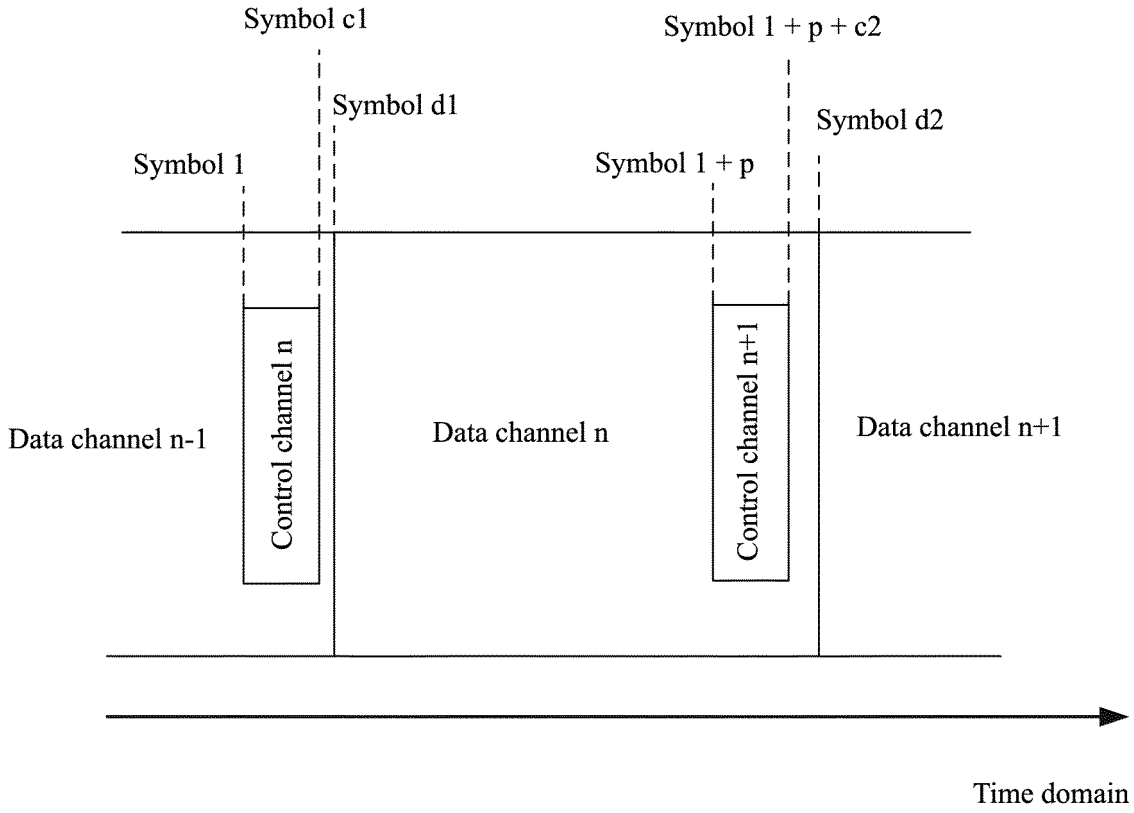
Symbol c1
Symbol 1 + p + c2
Symbol d1
Symbol d2
Symbol 1
Symbol 1 + p
Control channel n
Control channel n+1
Data channel n-1
Data channel n
Data channel n+1
Time domain

FIG. 4

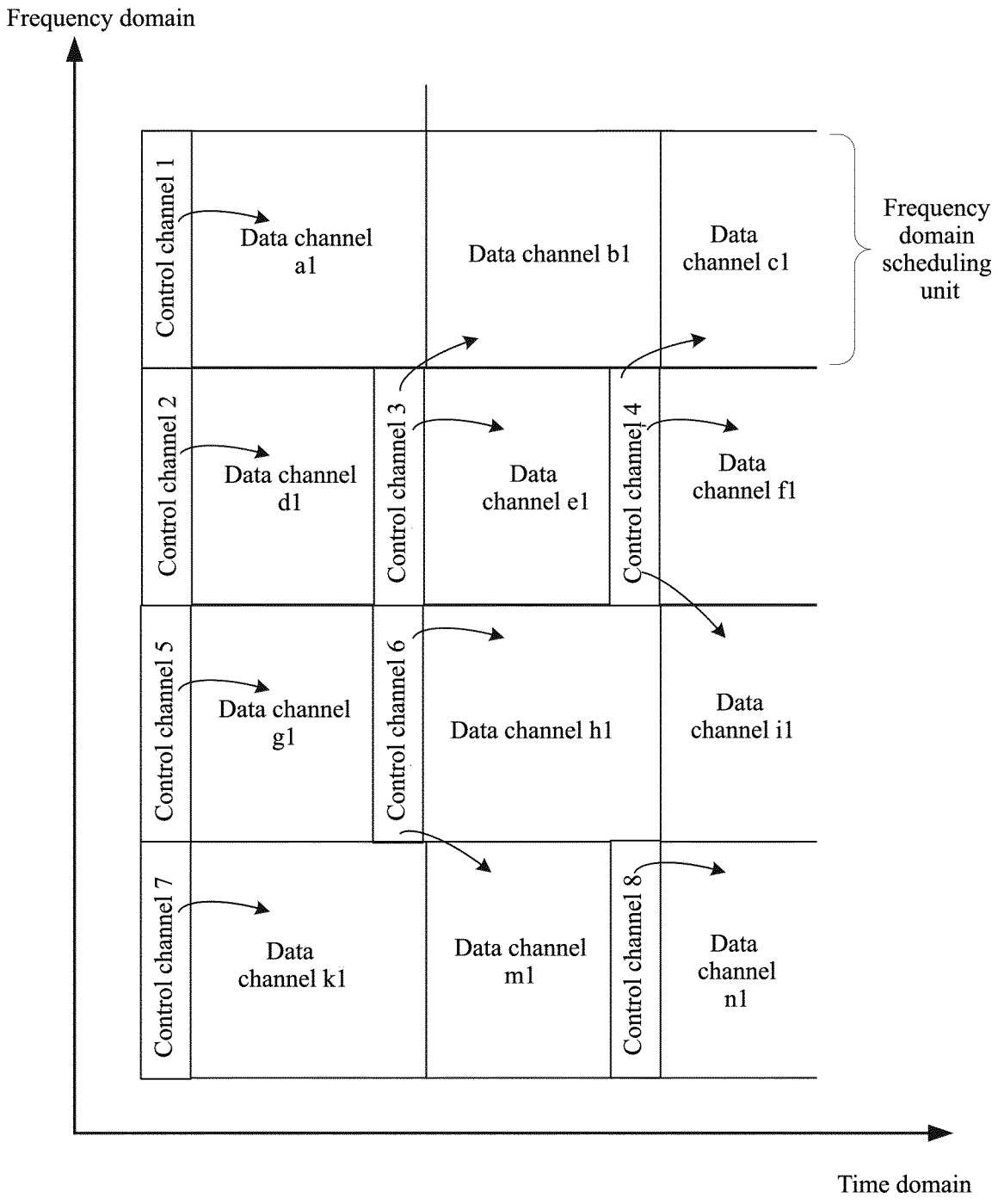
Frequency domain
Control channel 1
Data channel a1
Data channel b1
Data channel c1
Frequency domain scheduling unit
Control channel 2
Data channel d1
Control channel 3
Data channel e1
Control channel 4
Data channel f1
Control channel 5
Data channel g1
Control channel 6
Data channel h1
Data channel i1
Control channel 7
Data channel k1
Data channel m1
Control channel 8
Data channel n1
Time domain

FIG. 5a

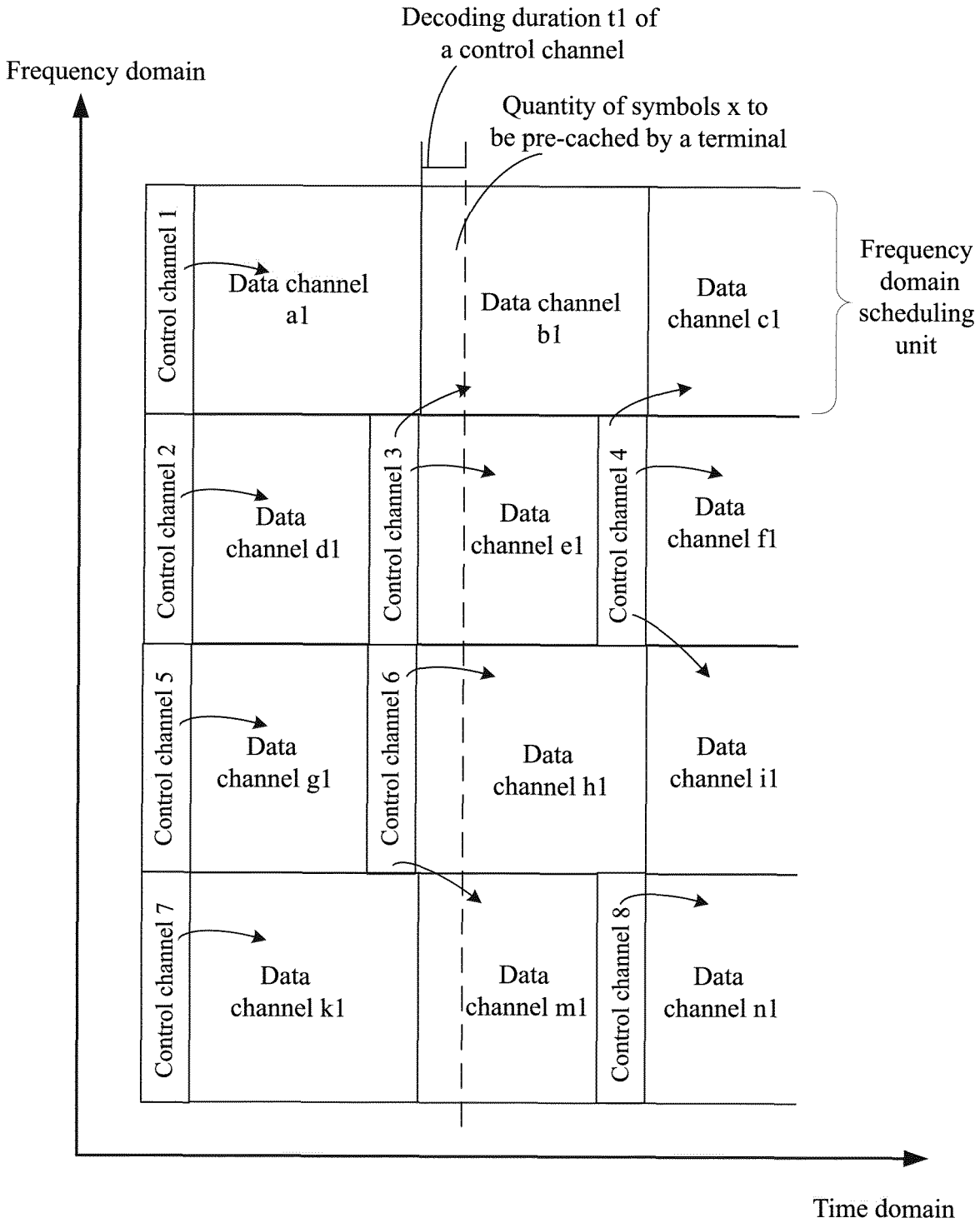
Decoding duration t1 of a control channel
Frequency domain
Quantity of symbols x to be pre-cached by a terminal
Control channel 1
Data channel a1
Data channel b1
Data channel c1
Frequency domain scheduling unit
Control channel 2
Data channel d1
Control channel 3
Data channel e1
Control channel 4
Data channel f1
Control channel 5
Data channel g1
Control channel 6
Data channel h1
Data channel i1
Control channel 7
Data channel k1
Data channel m1
Control channel 8
Data channel n1
Time domain

FIG. 5b

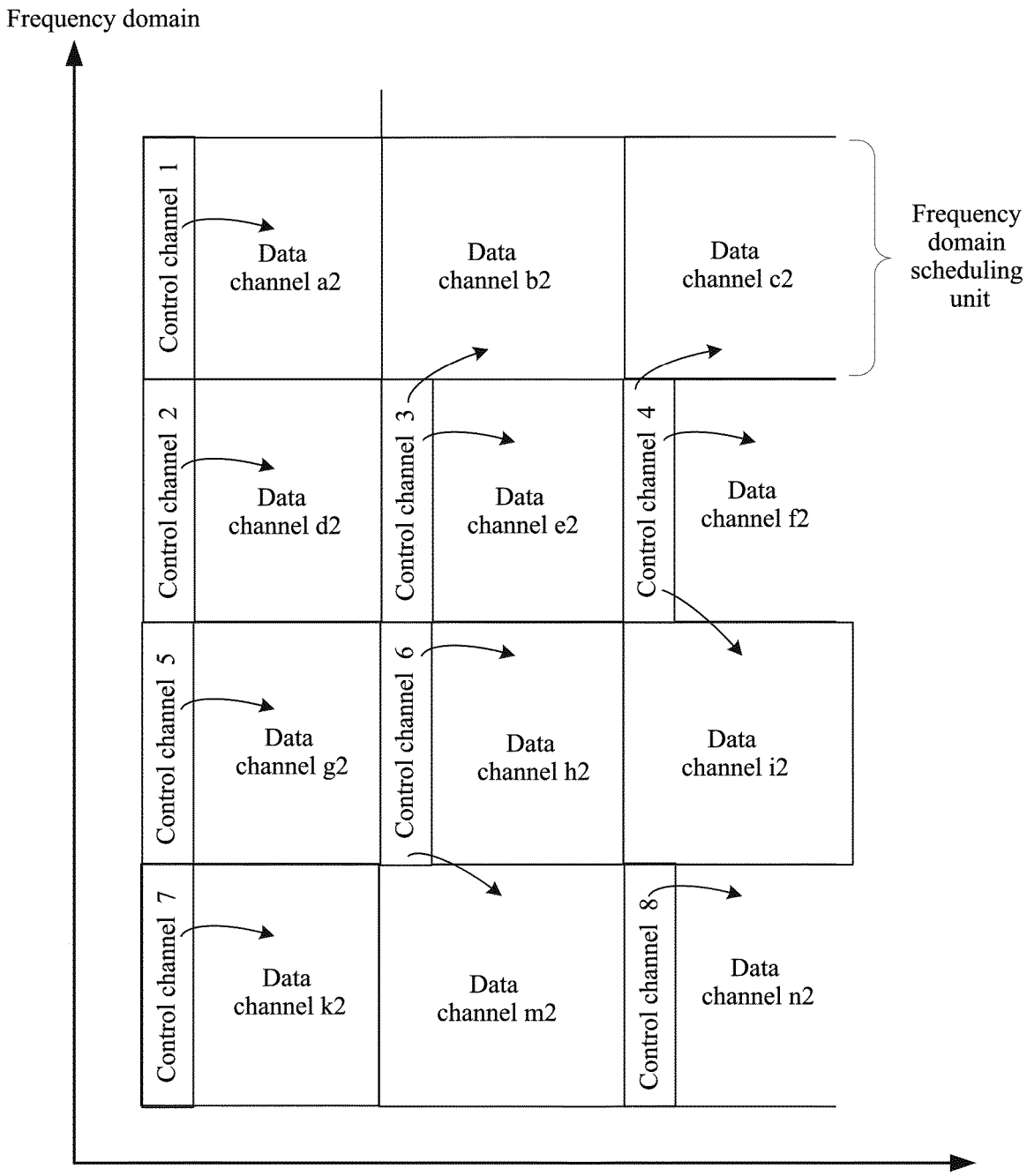
Frequency domain
Control channel 1
Data channel a2
Data channel b2
Data channel c2
Frequency domain scheduling unit
Control channel 2
Data channel d2
Control channel 3
Data channel e2
Control channel 4
Data channel f2
Control channel 5
Data channel g2
Control channel 6
Data channel h2
Data channel i2
Control channel 7
Data channel k2
Data channel m2
Control channel 8
Data channel n2

FIG. 5c

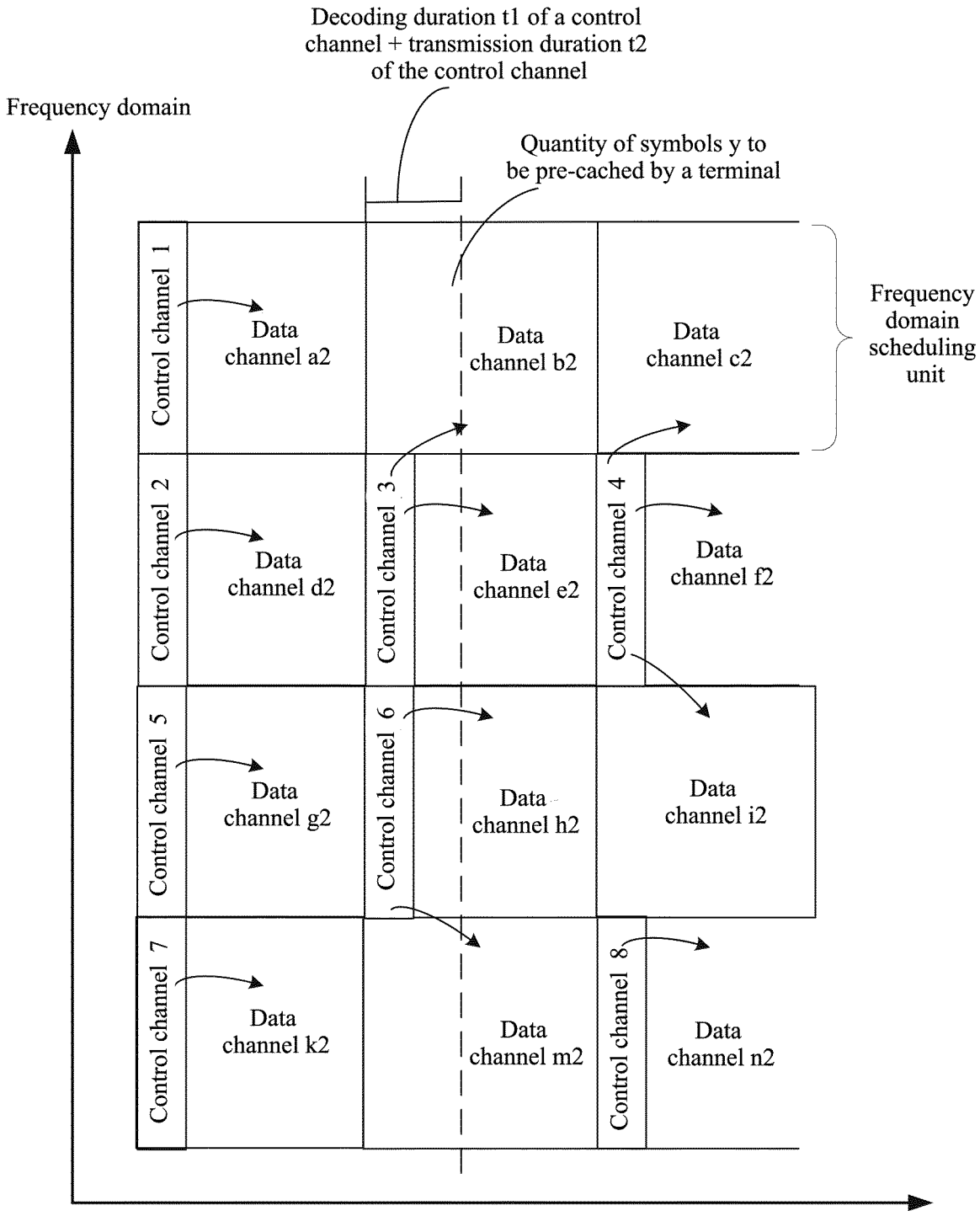
Decoding duration t1 of a control channel + transmission duration t2 of the control channel
Frequency domain
Quantity of symbols y to be pre-cached by a terminal
Control channel 1
Data channel a2
Data channel b2
Data channel c2
Frequency domain scheduling unit
Control channel 2
Data channel d2
Control channel 3
Data channel e2
Control channel 4
Data channel f2
Control channel 5
Data channel g2
Control channel 6
Data channel h2
Data channel i2
Control channel 7
Data channel k2
Data channel m2
Control channel 8
Data channel n2

FIG. 5d

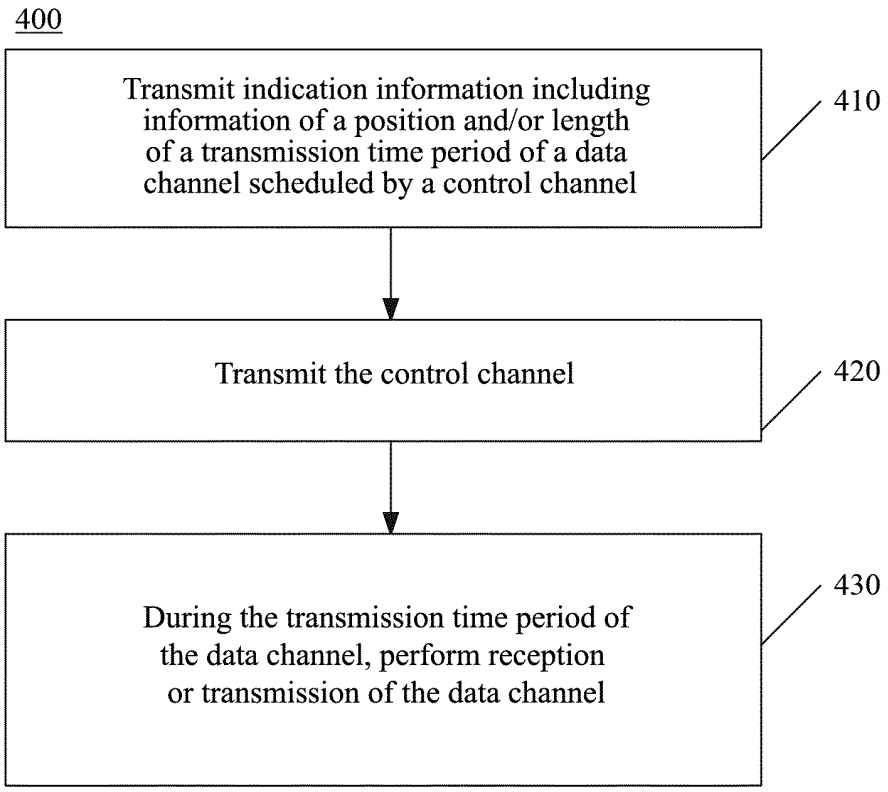
400
Transmit indication information including information of a position and/or length of a transmission time period of a data channel scheduled by a control channel
410
Transmit the control channel
420
During the transmission time period of the data channel, perform reception or transmission of the data channel
430

FIG. 6

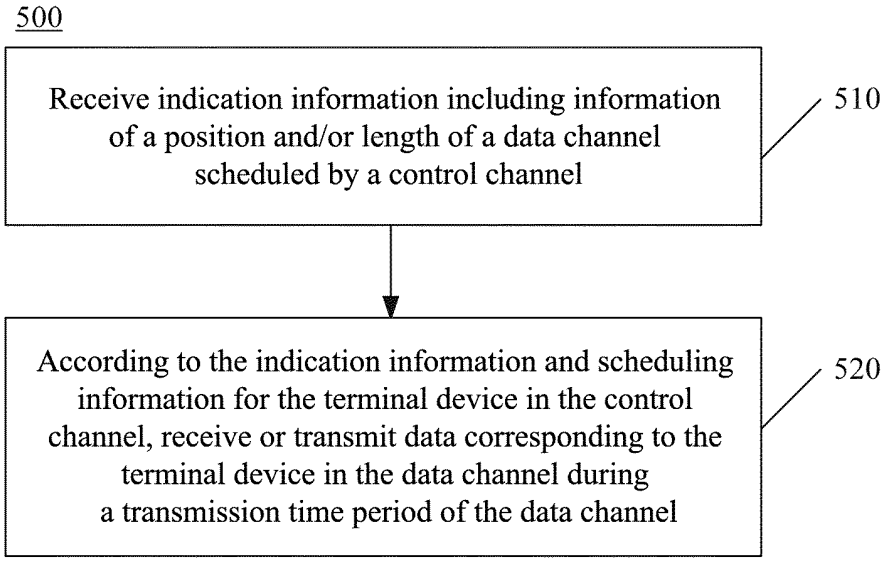
500
Receive indication information including information of a position and/or length of a data channel scheduled by a control channel
510
According to the indication information and scheduling information for the terminal device in the control channel, receive or transmit data corresponding to the terminal device in the data channel during a transmission time period of the data channel
520

FIG. 7

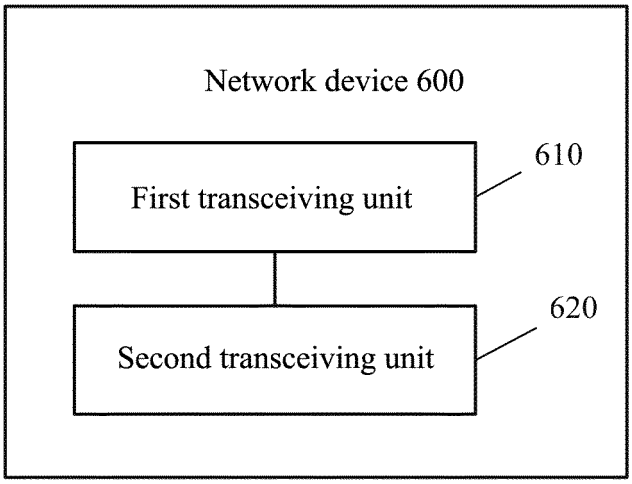
Network device 600
First transceiving unit
610
Second transceiving unit
620

FIG. 8

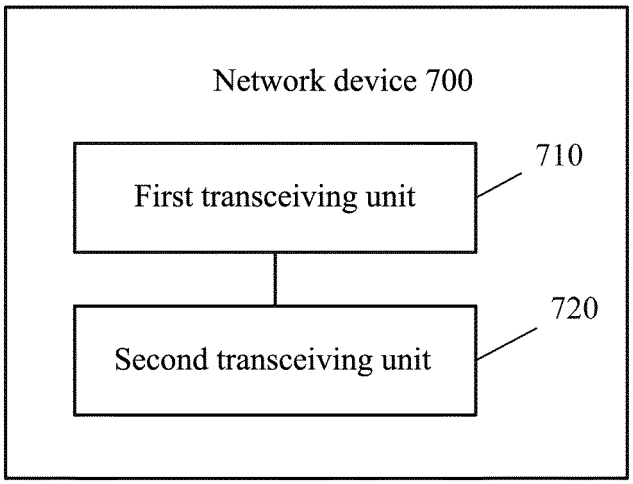
Network device 700
First transceiving unit
710
Second transceiving unit
720

FIG. 9

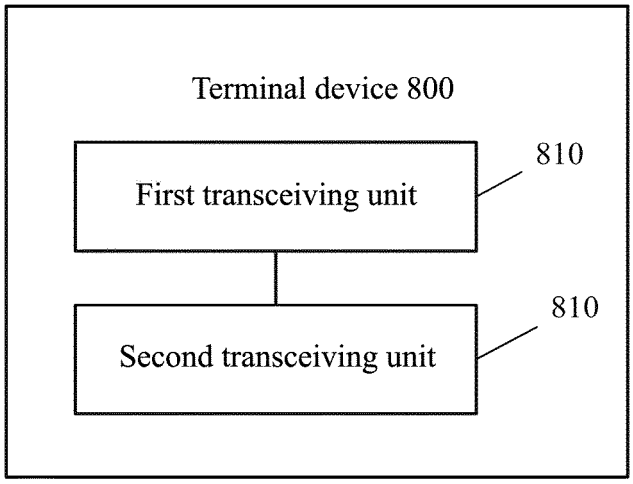
Terminal device 800
First transceiving unit
810
Second transceiving unit
810

FIG. 10

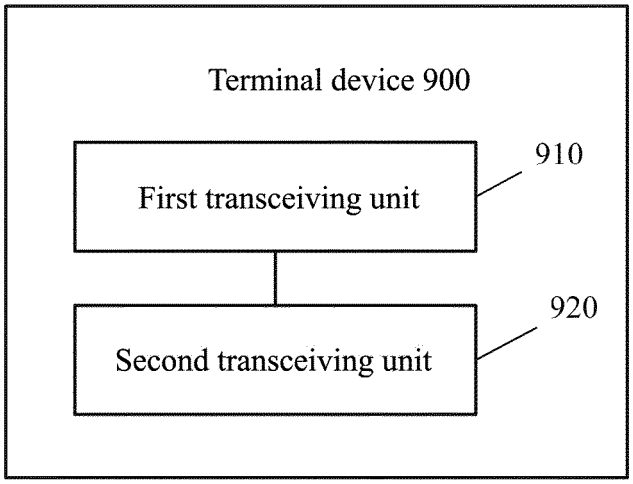
Terminal device 900
First transceiving unit
910
Second transceiving unit
920

FIG. 11

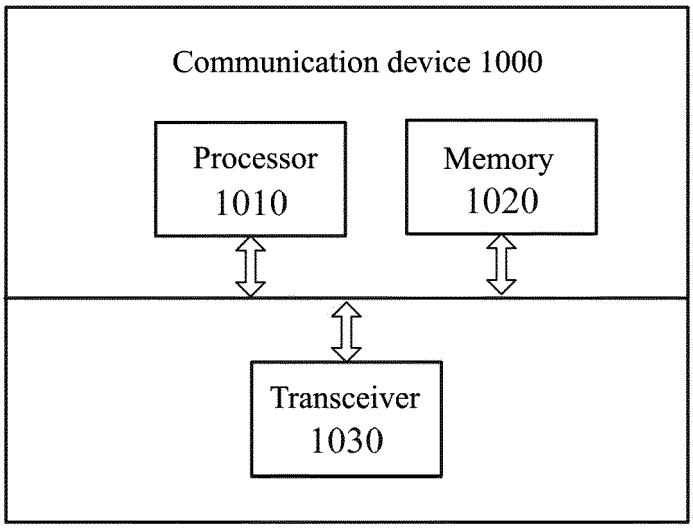
Communication device 1000
Processor
1010
Memory
1020
Transceiver
1030

FIG. 12

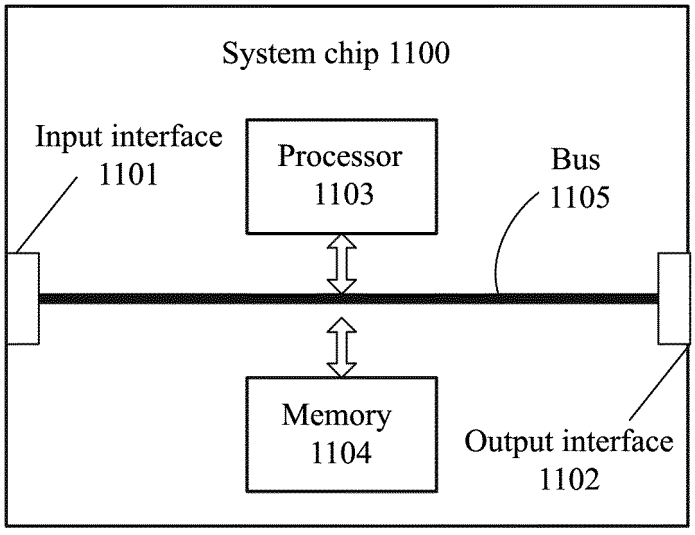
System chip 1100
Input interface
1101
Processor
1103
Bus
1105
Memory
1104
Output interface
1102

FIG. 13

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/112216

A. CLASSIFICATION OF SUBJECT MATTER

H04W 72/04 (2009.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04W; H04L; H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNPAT, WPI, EPODOC, CNKI, 3GPP: PDSCH, PDCCH, e-PDCCH, 控制信道, 数据信道, 扩展, 调度, 区域, 频分复用, UE, 终端, 能力, 子帧, 位置, 时间, 通知, 基站, eNB, eNodeB, control, data, channel, enhance, extend, schedule, region, frequency, multiplex, terminal, device, capacity, subframe, position, time, notify, base station

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 103503546 A (NTT DOCOMO INC.) 08 January 2014 (08.01.2014), description, paragraphs [0031]-[0074]	11-14, 25-28, 39-42, 53-56
A	CN 103503546 A (NTT DOCOMO INC.) 08 January 2014 (08.01.2014), description, paragraphs [0031]-[0074]	1-10, 15-24, 29-38, 43-52
A	CN 103312650 A (HUAWEI TECHNOLOGIES CO., LTD.) 18 September 2013 (18.09.2013), entire document	1-56
A	CN 103312649 A (HUAWEI DEVICE CO., LTD.) 18 September 2013 (18.09.2013), entire document	1-56
A	CN 102932299 A (POTEVIO INFORMATION TECHNOLOGY RESEARCH INSTITUTE CO., LTD.) 13 February 2013 (13.02.2013), entire document	1-56

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
01 September 2017	30 September 2017

Name and mailing address of the ISA	Authorized officer
State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	WU, Xianghui Telephone No. (86-10) 82245237

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/112216

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2015163771 A1 (LG ELECTRONICS INC.) 11 June 2015 (11.06.2015), entire document	1-56

Form PCT/ISA /210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2016/112216

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 103503546 A	08 January 2014	MX 2013012697 A	06 December 2013
		JP 2012235354 A	29 November 2012
		EP 2706801 A1	12 March 2014
		WO 2012150687 A1	08 November 2012
		US 2014086201 A1	27 March 2014
		KR 20140034199 A	19 March 2014
CN 103312650 A	18 September 2013	WO 2013135129 A1	19 September 2013
CN 103312649 A	18 September 2013	SG 10201701241T A	27 April 2017
		US 2017181138 A1	22 June 2017
		EP 2827663 A1	21 January 2015
		WO 2013135032 A1	19 September 2013
		US 2015098409 A1	09 April 2015
CN 102932299 A	13 February 2013	None	
US 2015163771 A1	11 June 2015	US 2017079022 A1	16 March 2017
		US 2016044643 A1	11 February 2016
		JP 2014523676 A	11 September 2014
		CN 103703706 A	02 April 2014
		KR 20140036186 A	25 March 2014
		WO 2013009005 A2	17 January 2013

Form PCT/ISA /210 (patent family annex) (July 2009)